

's' Series (UK) Smart Gas Meter User & Safety Manual



G4 RF1 sV ZB

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Note: The meter described in this document is in development. The content of this document is subject to change and will only be confirmed when the development is complete.

1 Introduction

This document describes and defines the Smart Gas meter for the UK market.

1.1 ATTENTION

“s” Series Meter has an internal valve.

After each automatic shut-off of gas supply by the meter:

1. Ensure that all gas appliances are turned off (command button in closed position).
2. AFTER STEP 1 ONLY, proceed with meter opening according to the procedure described in this user manual.
3. WAIT 3 minutes (180 seconds) minimum before turning back on all the gas appliances, this needs to be according to the safety instructions required by the manufacturer.

Battery Warning

- This product contains a Lithium Battery
- Fire, explosion and severe burn hazard.
- Do not recharge, short circuit, crush, disassemble, heat above 100°C (212°F), incinerate or expose contents to water.
- Do not solder directly to the cell.
- Respect the storage and disposal recommendations.



Safety Warning:

Static Hazard – Clean the meter only with a damp cloth

Keep this manual easily accessible for all installers.

Please respect all national rules for installation, operation and service of gas meters.

2 Important Safety Instructions

The following important safety instructions have to be ensured:

- All national rules for installation, operation, inspection and maintenance of gas meters must be respected.
- The 's' Series smart gas meters are designed to measure gases of the 1st, 2nd and 3rd gas family as specified in EN437 as well as various filtered and non-corrosive gases.
- If aggressive gases are to be measured, please contact Itron for specific advice.
- If there is a risk of internal or external corrosion, inspect the device regularly. If the device is clearly affected by corrosion, put it out of use.
- The operating conditions indicated on the nameplate, especially maximum admissible operation pressure and flow rate have to be respected. The device is not designed to withstand earthquakes and floods.
- Repairs of the device must be performed by properly instructed skilled personnel only. Repairs must be followed by a leakage test with 1.5 x maximum pressure. The guarantee only covers repairs done by Itron.
- Relieve internal pressure completely before removing the device. Ensure proper ventilation because of possible escapes of residual gas. Cap the inlet/outlet connections.
- For installation, follow the instructions mentioned in the section "Installation and Commissioning".

3 EC Directives

The meter meets the requirements and is marked in accordance with the following directives:

Directive 2004/22/EC (MID) of the European Parliament and of the Council of 31 March 2004 on measuring instruments

Directive 94/9/EC (ATEX) of the European Parliament and of the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres:

- | | |
|--------------------------------------|----------------|
| ▪ Device group and category | II 3G |
| ▪ Gas group | IIA |
| ▪ Temperature class | T3 |
| ▪ Ambient temperature ⁽¹⁾ | -25°C to +55°C |

Directive 1999/5/EC (RTTE) of the European Parliament and of the Council of 9 March 1999 on Radio and telecommunications terminal equipment

The batteries comply with the battery directive:

Directive 2006/6/EC (Batteries directive) of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries

4 Transport and Storage

For transport and storage, the following instructions have to be considered:

- Before installation, the meter must be checked for possible damage. Never install a damaged meter.
- The caps fitted at the inlet and outlet connections must stay in place until installation.
- Storage temperature range of -40° to $+70^{\circ}\text{C}$ (4 hours maximum between $+55^{\circ}$ and 70°C) has to be ensured.
- Handle gas meters with care during transport. Shock must be avoided. On receipt, carefully examine the shipping container and the meter itself for any external damage. Any visible damage should be reported to the carrier. Always keep the meter vertical during transport and installation. Make sure it is well fixed on the lorry and handled without dropping. Please note that the packing material of the meters shall be recycled.
- Do not remove any seal from the meter; you will invalidate the guarantee of the product and maybe the metrological approval of the meter.

5 Description

Itron's 's' Series meter is a result of combining more than 100 years of diaphragm meter engineering experience with latest high quality electronic and communication technologies. As a part of the end-to-end smart metering system 's' Series is the latest development. It consists of a gas containing steel case, enclosing a diaphragm measuring unit and shut off valve, connected to an electronics unit which is enclosed in a housing mounted on the outside of the steel case. The measuring unit is latest version of the field proven 2 litre RF1 diaphragm unit, which has been used in large volumes for many years and in many different environments.

The shut off valve is designed to minimise the time and energy involved in operation in a way that the effect on battery life is less critical and also simplify user operation. It is located in the outlet of the measuring unit, and consists of an integrated electronic and mechanical unit. It is connected to the external electronics unit through the steel case, whilst still enabling the meter to meet the high ambient temperature requirement.


The electronics unit includes interchangeable batteries and communication modules, located under a sealed cover. The electronics unit uses a proven optical detection in order to provide accurate, low power and bi-directional functionality.

The modular communications interface design offers the possibility to choose from a range of different communication protocols and interfaces as per the customer requirements. The normal interface for UK is Zigbee Smart Energy.

The meter is connected to the gas supply through standard size UK bosses, with the outlet boss (on the right when facing the meter) having a pressure test point incorporated. "s" Series meter is available in the following variants and sizes for UK.

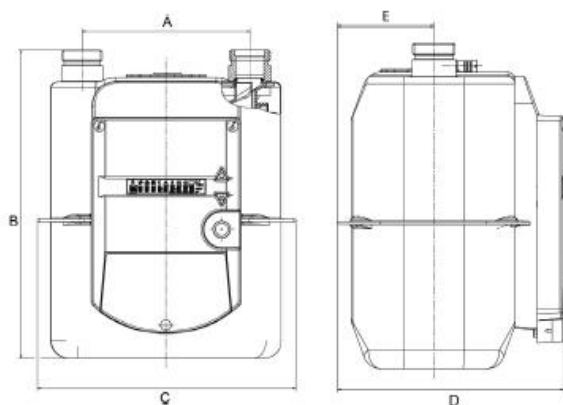
Product Name	Available Sizes	Description
RF1 sV ZB	G4	RF1 meter with a ZigBee communication

6 Characteristics

<i>Properties</i>	<i>Technical Data</i>
Meter sizes	G4
Cyclic volume	2.0L ±0.1L
Transportation Temperature	-25°C to +55°C, +70°C for up to 8 hours
Storage and Operating Ambient Temperature	-25°C to +55°C
Degree of Protection	IP54 (EN 62059)
Operating Humidity	<= 93%, between -25°C and +40°C <= 90%, between +40°C and +55°C
Gas Temperature	-25°C to +55°C
Gas type	Groups L and H (2 nd family of EN437) and LPG
Gas conditions	Clean and non-condensing gas
Gas Pressure	0-100 mbar
Gas Flow rates	In accordance with EN1359 table 1 G4 Q_{min} 0.04m ³ /hr, Q_{max} 6m ³ /hr
Pressure Absorption	<2 mbar
ATEX	Zone 2 :  II 3G Ex ic ia IIA T3 Gc
Maintenance	Field changeable battery and communication modules
Battery	Lithium batteries with an average lifetime of minimum 15 years under reference conditions
Accuracy	Class 1.5
Display	LCD with icons and 9 segment characters
Mechanical Environment	M1
Electronic Environment	E2
Color	Grey

7 Construction

7.1 Dimensions



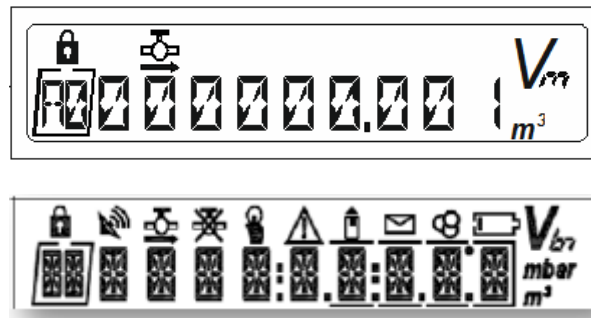
A	152 mm
B	279 mm
C	233 mm
D	194 mm
E	83 mm

The meter has bosses to BS 746:2005+A1:2009 spaced at 6" pitch and is suitable for installation in accordance with BS 6400-1:2006 and for use in meter boxes to BS8499.

Meter Location: Indoor or sheltered outdoor, protected from rain and sun
Atex zone 2, MID EMC E2

7.2 Display

The display consists of an LCD with icons and 9 segment characters as shown in the diagram below.



The display shows measured Gas Volume (m^3) and can sequence through a range of other parameters, including consumption in kWh, Tariff, Time, Date and Credit.

The icons are used to indicate low credit, valve status, valve able to be opened, low battery, Emergency Credit, Communication status, legally relevant display, message available, monetary value.

Volume characters are 8mm high, 6 mm wide.

8 Tamper and Security

Access to the meter is protected by metrological seals – attempts to tamper will leave visible marks. In addition detection of opening of the metrological part is detected electronically and reported as an alarm

Access to the battery/communications department is protected by utility seal and is separately detected and reported electronically. Battery change does not require any change to metrology seals.

The meter metrology is able to operate correctly in normal magnetic fields and is able detect and report high magnetic fields which may affect metrology.

The meter monitors ambient temperature and will detect and report attempts to tamper by excess ambient temperature.

9 Communication

The meter has an optical port for maintenance and a Zigbee Radio module for normal use. The optical port is normally disabled after manufacturing.

Optical Port: EN62056-21:2002

Zigbee Module Zigbee Pro stack, Smart Energy profile
2.4 GHz ISM band

Zigbee Application SEP1.2 with

Zigbee Clusters supported:

End point	Cluster - Client Side	Cluster - Server Side
Gas Meter	Time	Basic
	Key Establishment	Key Establishment
	Price	Metering
	TOU Calendar	Prepayment
	OTA Upgrade	Message
	Device Management	

Zigbee Mirror/Sleepy device: The Meter is a sleepy end device and requires the Client ESI to support mirroring. The Meter wakes periodically to update the values in the mirror and check for any required actions

10 Prepayment and Credit Operation

The meter can operate in Credit mode and Prepayment mode in accordance with the tariff.

10.1 Tariff

The meter is able to operate according to tariffs, defined in £p/kWh. The Meter utilises the defined Calorific Value to determine gas use in kWh and hence the applicable charge, based on the volume measured.

10.2 Credit Mode

In Credit mode the valve is open and the meter uses the tariff information to estimate the cost of gas consumed in the current billing period.

10.3 Prepayment Mode

In Prepayment mode, the meter maintains a credit balance.

11 Displays and Controls

The meter display displays the current status and together with the two buttons may be used to manage the meter.

11.1 Display Operation

The display is normally OFF and turns on when a button is pressed, turning OFF again after 30 seconds without activity.

When the Display is OFF the first button press switches ON the Display. The first Display shown depends on the mode and status of the meter:

- When configured in credit mode, the Display starts on Display A0
- When configured in prepayment mode, the meter starts on Display J0
- To navigate the displays:
 - Make short presses to the buttons to move within a specific row, e.g. A0 to A1 etc.
 - Make longer presses to change the column e.g. A to B etc.
 - The Blue “X” button increases the number or letter of the alphabet (1 to 2, A to B)
 - The Orange “triangle” button decreases the number or letter of the alphabet

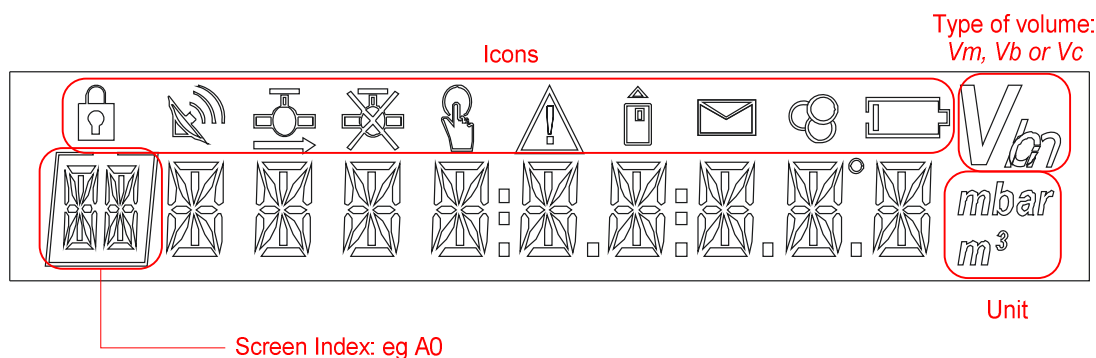


11.2 Display











The display consists of 4 parts:

- The “index” to indentify which display is showing
- The 9 Characters on the display with related decimal points and colons
- The Display type identifier
- The Display units
- The Icons

These are positioned as shown below:



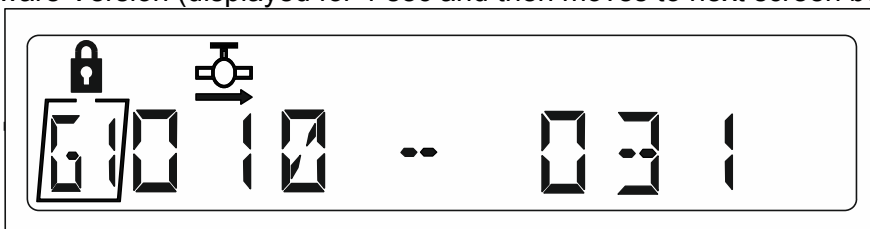
The icons have meanings as follows:

	Indicates that legally relevant data are currently displayed
	Indicates that the valve is open
	Indicates that the valve is closed
	Indicates that the valve is released (may be opened by the user)
	Steady: credit is below low credit threshold
	Steady: Emergency credit is available Flashing: Emergency credit is ready to be used No Icon Emergency credit is not available/exhausted
	Is flashing to indicate that the battery has reached his estimated end of life
	is displayed, if the communication module is connected to the network. Is flashing when the meter is trying to join a network
	Is on when a message is available
	Not used

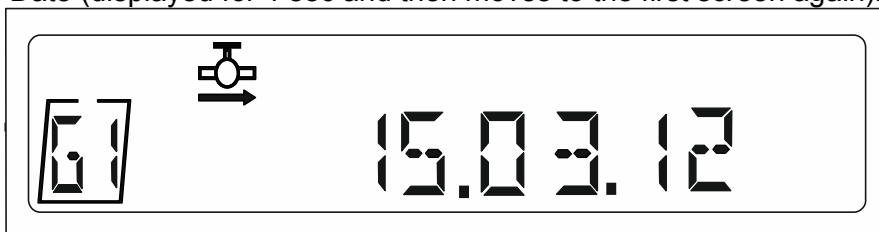
11.3 F/W versions

The meter is also capable of displaying the Firmware version on the screen. This can be seen in Menu G1 of the meter. The date when the current firmware was loaded in the meter is also visible. The screen in menu G1 first displays the firmware version and then the date in a continuous cycle. Each entity appears on the screen for one second as shown below.

Firmware Version (displayed for 1 sec and then moves to next screen below):



Date (displayed for 1 sec and then moves to the first screen again):



12 Firmware Update

The meter is able to update its firmware via “Over the Air Update” using the defined Zigbee SE process. The update process is managed with controls to verify the completeness and correctness of the firmware before a change to the updated firmware. The meter continues to measure during the update process.

13 Battery

The meter contains Lithium batteries.

13.1 Battery Life

The life of the batteries is dependent on the use of the meter, including the frequency and length of communications.

The battery life in defined conditions is 15 years

13.2 Battery Safety

The battery selected forms part of the Atex, RTTE and MID approvals for the Meter.

The battery **MUST NOT** be changed in a hazardous area.

The battery must only be changed by trained operator.

The battery uses lithium construction, and therefore waste disposal needs to be considered carefully.

The following warning applies to the battery:

“Warning: Do not recharge, open, heat or dispose of in fire. Do not drop, damage, immerse, force discharge or short circuit”.

Therefore as applied to the Meter:

“Warning: Do not open, heat or dispose of in fire. Do not drop, damage, or immerse”.

14 Battery/Communication Module Exchange

The Batteries and Communication module may be exchanged in the field by a Meter Worker only. The cover is protected by a seal to prevent unauthorised access.

15 Functional Safety

The meter is designed to EN61508:2010 Functional safety of electrical/electronic/programmable electronic safety-related systems, SIL2 requirement.

16 Marking

The Meter is marked with the markings required by the MID, RTTE, Atex directives and includes the meter number information and barcode.

The meter bears on its front face resistant and secure markings that include:

- Logo/name of manufacturer
- Accuracy class (1.5)
- Maximum and minimum ambient temperature
- Maximum approvable gas overpressure
- Qmax, Qmin and Qt
- Meter type
- Cyclic volume
- Numbers of the EC-Type Examination Certificate (reference to directives : MID)
- CE-marking plus additional metrology marking
- Declaration of measuring unit [m³] in immediate proximity to the digit with the lowest value of the totalizing unit
- ATEX marking
- Equipment identifier
- Itron serial number
- Year of manufacturing
- Manufacturer site
- Customer specific information (serial number including Bar Code in customer defined format)

17 Installation

The Meter must be installed in the network, in a manner that complies with the requirements of:

- Gas Acts, Various
- Health and Safety at Work Act
- Gas Safety (Management) Regulations
- Gas Safety (Installation and Use) Regulations
- OFGEM Codes of Practice 1A and/or 1C.

The installation must be made with the Meter upright (within 10° of vertical in both planes), below a Meter support bar

Any necessary meter pipe work, soldering, drilling or other installation works must be completed before the meter is unboxed, uncapped and fitted.

The commissioning operation takes place after a Meter has been installed in the network. The Meter is intended for installation in domestic premises. The Meter must only be installed with the occupier present. Installations must be made in accordance with BS6400.

17.1 Installer.

The installer must be suitably qualified to complete the installation safely, and must instruct the occupier of the premises in the safe operation of the Meter. Additionally, the person fitting the Meter MUST be a "Competent Person" (that is, registered Gas Safe, or similar/successors).

The Meter installer must be registered with OFGEM as an OAMI (Ofgem Accredited Meter Installer).

17.2 Pressure.

Pmax = 100 mbar

Normal Working Pressure = 21 mbar

The Meter will impose less than 2 mbar pressure drop at 6 m³/hr (when the Valve is open)

17.3 Location.

The Meter may be installed indoors in a suitably ventilated area, or in an outdoor Meter box constructed for the installation of Gas meters, and compliant with the requirements of BS6400, provided that the door is fitted to the box and is kept closed at all times, excepting when interaction with the meter is necessary.

17.4 Safety

The safe operation of the Meter and installation may be impaired if the Meter is damaged in any way. The Meter must not be punctured, drilled, distorted, deformed, cracked, dropped, exposed to temperatures, flow or gas pressure/differential pressure/gas system outside specified range, soaked, submerged, radiated or otherwise interfered with. If the Meter has or may have suffered from any of these factors or there is any indication of damage or interference to the Meter (including damage to seals or fixings) the safety and integrity could be impaired and it must not be installed or if already installed must be removed.

See also Section 13.2 regarding the battery.

17.5 Transportation

The Meter contains Lithium Batteries and must always be transported appropriately. See Section 13 for details about the batteries.